SF
545
C58

UC-NRLF
$B 277 314

MANUAL

CONTAINING

INFORMATION RESPECTING THE GROWTH

OF THE

MULBERRY TREE,

WITH

SUITABLE DIRECTIONS

FOR THE

CULTURE OF SILK.

IN THREE PARTS.

By J. H. COBB, A. M.

PUBLISHED BY DIRECTION OF HIS EXCELLENCY GOV. LINCOLN,
AGREEABLY TO A RESOLVE OF THE COMMONWEALTH.

Ostendens hujus muneris usum.—*Vida in Bombyx.*

BOSTON:
CARTER & HENDEE.
M DCCC XXXII.

YB 16253

THE SILK CULTURIST.

Silk Culture and Mulberry Speculation.

The editorial article on this subject which appears in this number, (page 389) was in type (except the closing postscript.) before the reception of the communication of Thomas Hicks, Esq. which was published in the preceding number (page 378;) and the first named article was expected to have been presented, in the proper order of time, before the latter. Our absence caused the omission—and the consequent awkwardness of appearance of our notes to Mr. Hick's letter, which were written to follow, though in fact they preceded the publication of the older article.

It has happened upon several occasions, in this work, that a communication exhibiting errors and mistakes of the writer, has served to bring forth correct and full information on the subject, from others better informed. We hope, and have now reason to expect, that such will be the fruit of our remarks on what may be termed (in more than one sense) the *mystery* of silk culture in this country. We have been seeking, by other means, as well as by the publication of the article referred to, (and its still earlier communication in the proof sheet,) to obtain information on this interesting subject; and we are promised, and hope to receive, in part, before the appearance of this number, from two very intelligent and well-informed correspondents, interesting and valuable information on different branches of this subject.

In the time which has elapsed since the printing of the article referred to, we have heard of circumstances which, if of earlier occurrence, would have varied the details, and some of the inferences, though they serve to confirm the correctness of the general views there presented. The demand for plants of the Chinese mulberry has indeed so greatly increased at the north, that every plant and cutting now in Virginia, may be sold this year to northern purchasers at the highest prices. To our previous views and recommendations, therefore, we would add the advice to all who have plants to spare, not to sell any to speculators lower than at the highest prices; to raise as many plants as possible in 1839, from the stock retained, and to be prepared then to supply the whole country at greatly reduced prices, and yet at greater profits than the highest prices at present would give. Every single bud planted next spring, and well taken care of, will produce from 10 to 70 buds—say not less than 30 on an average; and therefore at a half-e even a quarter cent the bud, the sock will yield a much greater sum than th sent growing stock at 2 cents the bud, or 30 cents the rooted plant. But w the sales are made this year at the high price, or next year at much lov gratifying that the course of trade iss pletely turned, and that northern pu are now coming to the south for suppli that this year more money will this to Virginia, than all that the northern rymen have before got from us for th mature and defective plants, with wh state was stocked.

It is not merely the rage of spec stimulated by legislative bounties, caused this great demand at the north is a real and great scarcity of *morus caulis*, caused by the immense loss of by the wet and cold weather of l and early spring, and the drought

The following communication M tersburg Intelligencer shows that o respondent, Mr. Hicks, of Brunsw ready been well paid (and it was l purchasers,) for his enterprise. sundry large dealers and speculat ready gone through lower Virgini engaged. (and we fear, generally price they were willing to pay,) al of the *morus multicaulis* they for sale.

Lawrenceville, Aug.

"I think the public ought to kn Thomas Hicks, of this county, u fore last, and last year, laid out $2 nese mulberry trees; and this fal for sale 30,000 trees. Two day a 20,000 to some gentlemen in Pen at 25 cents a tree—the residue h sell in this vicinity; having realied some sum of $7,500, from so inc an outlay, in so short a time. Mr. so pects to have, by tall twelve mont trees more for sale, and in all pro get nearly quite as much per tre also commenced the past seaso silk, and has succeeded beyond l tions, demonstrating that our cou genial to the production of that be valuable article. Mr. H. deserves, and has the congratulations of the ty for his enterprise and success i ing a new source of revenue and p county."

Having written to Mr. Hicks to k ther this statement was entirely c has stated in reply that the writer h some mistakes, which he corrects a

"The outlay for my plants was $345 instead of $245; and the time allotted me to raise the trees is one year more than I have been employed. I never saw a Chinese mulberry tree until last year, (summer of 1837.) I think it probable I may be able to plant 200,000 cuttings next spring, instead of 150,000. The balance of the letter is all correct." "If I had not sold the 20,000 trees, they would now bring me $1000 more than I am to receive." This letter is dated September 8th, which was 12 days only after the sale had been made.

Since the 20th of August, the agents of at least five different and distant *multicaulis* dealers have visited this place, for the purpose of purchasing the plants which are in and near Petersburg. Most of these agents have come since the first of these lines were written. So rapid and violent has been the rise of the *multicaulis* speculation that our monthly publication can give but a faint idea of its progress. For the last month, almost daily reports would have been necessary to show the state of the trade, and the extent of the demand. Considering that the northern states are the original seat, and still the principal scene, of this speculation—the great void which still is to fill, throughout both the north and the south, for actual as well as speculative demand—the difficulty with which young *multicaulis* plants are raised in the north, and the far greater vigor in growing and after-value of those raised in Virginia—it will not be more strange than the present state of things, if very high prices should continue to be maintained through another year. But all prudent holders and planters here ought so to act as to be prepared to meet a great reduction of price. The few persons who are so fortunate as to have many growing plants, of course, will do right to make the most of the present demand for their surplus stock. But with a view to all interests, it will be better to plant next spring than to sell *abroad* now; as 8 cents, or even 6 cents the tree, in 1839, will pay a far better profit, than to sell the stock grown in 1838 for four times those prices—which may now be readily obtained. Much money must be brought into Virginia from other states by the mania for this trade; and so far to effect a general spreading of the *multicaulis*, which this mania certainly will, it will produce much benefit to public interests. But when the violent fever shall have subsided, it is to be feared that as great a reaction (or non-action) will follow the unnatural excitement;

and that the proper business and regular and good profits of silk culture will be scorned and neglected.—[*Farmer's Register.*

A VALUABLE SUGGESTION.

Gideon B. Smith, Esq. of this city, has suggested a most valuable method of destroying the chrysalis in the cocoons of the silk worm. It consists simply in exposing them to the influence of ignited charcoal. A friend to whom he made the suggestion, has, we learn, made an experiment on his plan, which proved entirely successful, and we have no doubt, ourself, that, it will prove a most invaluable acquisition to silk culturists, as besides being the most economical method of killing the chrysalis, it will effect its object without hardening the gum on the cocoons, thus rendering them much easier to reel. On a rough calculation, we think fully one fourth of the expense of the process may be thus saved.

As has been the case in others of *his* discoveries, we should not be surprised, if some ingenious *savan* of Paris should make *the discovery* of this method, and that it should be trumpeted forth by the American press as a pearl of exceeding great price, as this is the country where "genius languishes and fancy dies," and *fashion* has long since decreed that the *old saw* of Shakespeare. that "that which we call a rose by any other name would smell as sweet," is a mere fiction of the brain—a coinage of the poet.—*Farmer and Gardener.*

Fig

Plate

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

MAIN LIB.-AGRI.

try at greatly re
er profits than the m
would give. Every sin
spring, and well taken ca
from 10 to 70 buds—say no

Fig 1

Fig 2

Fig 3

Fig 4

Fig 5

Fig 6

Fig 8

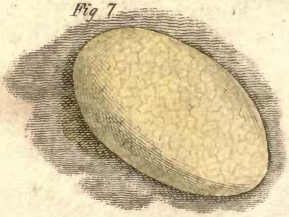


Fig 7

Pendleton. Direx! Boston.

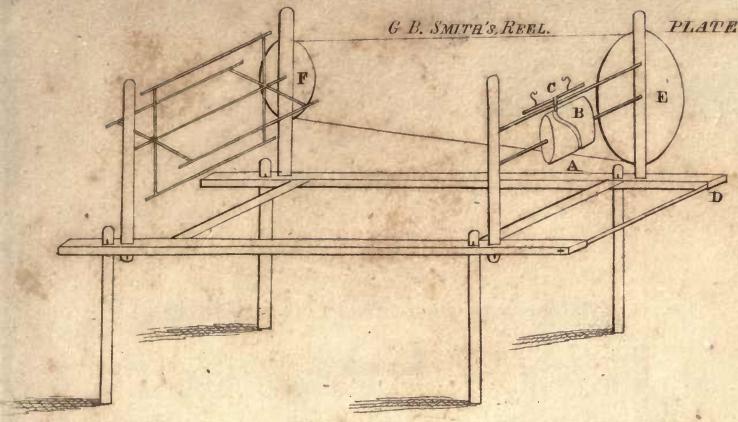
PLATE II.

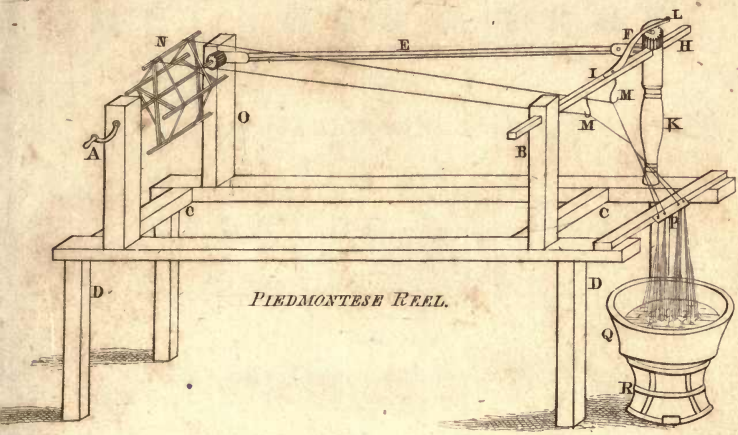
Fig 2

Fig 1

Fig 3

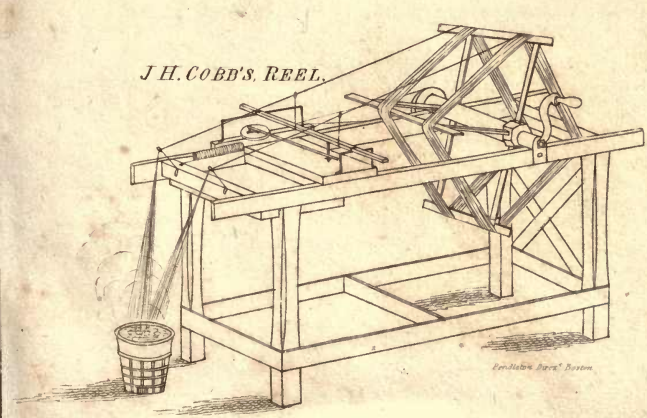
Penstrom Direx' Boston





PIEDMONTESE REEL.

J H. COBB'S REEL.



J. F. CLARK
190 MARKET ST. BALTIMORE

A

MANUAL

CONTAINING

INFORMATION RESPECTING THE GROWTH

OF THE

MULBERRY TREE,

WITH

SUITABLE DIRECTIONS

FOR THE

CULTURE OF SILK,

IN THREE PARTS.

By J. H. COBB, A. M.

PUBLISHED BY DIRECTION OF HIS EXCELLENCY GOV. LINCOLN,
AGREEABLY TO A RESOLVE OF THE COMMONWEALTH.

Ostendens hujus muneris usum.
Vida in Bombyx.

BOSTON,
PUBLISHED BY CARTER AND HENDEE.
M DCCC XXXII.

1832

MAIN LIB.-AGRIC.

BOSTON CLASSIC PRESS:

I. R. BUTTS.

SF 545
C58

INTRODUCTION.

HOUSE OF REPRESENTATIVES,

THURSDAY, FEB. 24, 1831.

MR WHEELER, from the Committee on Agriculture, who were instructed to consider the expediency of encouraging the growth of the MULBERRY TREE, and the Culture of SILK, made the following

REPORT.

The Committee have examined the subject attentively, and find it to be of much greater importance than was at first supposed. They are surprised to find how great a field is here open, and how long it has been neglected; they are satisfied beyond a doubt, that we have the power to produce and manufacture Silk in this Commonwealth to an immense extent, and that no difficulty is to be encountered either from soil or climate.

M818252

The nations of Europe are generally engaged in the culture and manufacture of silk. France, more than any other nation, derives her power and resources mainly from this branch of her industry; her example has induced England, Holland, Germany, Prussia and Sweden to engage with zeal in the same pursuit.

The culture of silk is important in relation to the amount of silk imported and consumed in this country, which exceeds seven millions of dollars, while the amount of bread stuff exported is on the average less than six millions of dollars! Facts like these need no comment; yet it is proper that we should bear in mind, that the vast sums thus expended for silk in its various forms, are paid indirectly to enrich the Agriculture and Manufacture of other nations, the raw material of which may be produced here with as much certainty as cotton or any other staple product.

The article of silk has already been produced by a few of our citizens in small quantities, of a quality not inferior to the best imported. Jonathan H. Cobb, Esq. of Dedham, has commenced the culture of silk with success, and has introduced some valuable improvements, especially in the art of reeling from the cocoon, and it is due to that gentleman, that the Committee should remark, that it is from practical information communicated by him, that they have derived some important facts in relation to this subject.

The state of society in this Commonwealth is well adapted to promote the successful culture of silk: it is an employment, in which females and children may be honorably and profitably engaged; with the exception of planting the Mulberry tree, the whole labor may be performed by that class of the community. The Committee feel warranted in

saying that so soon as the article can be produced, a good home market will be found at such prices as to afford a profit on the expense and labor bestowed upon it. The White Mulberry tree is easily cultivated, does not require the best soil, serves a valuable purpose for hedges, and is highly ornamental.

The Committee are satisfied that little capital is required to commence the culture of silk, except that capital which consists in knowledge. It is INFORMATION which is the foundation of Agriculture, as well as other arts. Nothing is so well calculated to call the attention of the public to this subject as *information* respecting its value, and the means by which our citizens may avail themselves of the advantages which are connected with it; for the purpose of disseminating this information the Committee have thought it their duty to report the following resolution.

Which is respectfully submitted.

For the Committee, ABEL WHEELER, *Chairman*.

House of Representatives, Feb. 24, 1831.

Resolved, That his Excellency the Governor be requested to cause to be compiled and printed a concise MANUAL, to contain the best information respecting the growth of the MULBERRY TREE, with suitable directions for the culture of SILK, — and that this manual be distributed in suitable numbers in the city of Boston, and to every town in the Commonwealth. — That to defray the expense thus incurred, he be authorized to draw his warrant on the treasury for a sum not exceeding six hundred dollars.

PREFACE.

In preparing this Manual the author has been guided by the personal experience which he has had for several years in the culture of the Mulberry Tree and rearing of Silk Worms in the State of Massachusetts.

In addition to the instruction which his own practical knowledge in the business has suggested, he has made use of the following works, from some of which he has made considerable extracts, where he found the instruction conveyed was such, as from the test of experience he could recommend, viz. — The Manual published under the authority of Congress; the two first numbers of the Silk Culturist, by Dr Felix Pascalis, of New York; Mr Wm. H. Vernon's abridgment of the large French work of M. de la Brousse; Essays on American Silk by Messrs D'Homergue and Du Ponceau, of Philadelphia; and a pamphlet published by Gideon B. Smith, Esq. of Baltimore. The author tenders his thanks to several of the above-named gentlemen for the liberty which they have permitted him to take, as also for many personal communications

on important branches of the business, which they have suggested to him in the short interviews he has had with them. From two of these gentlemen, of the highest respectability, he has received the subjoined testimonials.

Philadelphia. 27th June, 1831.

DEAR SIR — I have read with great satisfaction the Manual for the Culture of Silk which you have prepared by order of His excellency the Governor of Massachusetts, in pursuance of a resolution of your State Legislature, and am well pleased with the manner in which you have treated the subject. Availing myself of the permission you have given me, I have, with the aid of Mr D'Homergue, taken the liberty to suggest a few ideas on the blank leaves of the manuscript, of which you will make what use you shall think proper.

The works of foreign writers on the cultivation of mulberry trees and raising of silk worms, particularly in the latter, are by no means suited to the meridian of this country, and are rather calculated to discourage than instruct our farmers. You have with great propriety discarded their artificial heat, thermometers, barometers, hygrometers, and all their variety of troublesome methods, minute regulations and useless implements, which make the culture of silk a difficult and intricate science. I see no more difficulty in cultivating the mulberry than any other fruit tree; and the art of raising silk worms seems to reduce itself to a few simple rules easy of observance. I know but of one European author who has had the courage to break through the fetters of habit and prejudice; and in a late work on the culture of silk published in the German language at Vienna in 1829, adopted what I call the *American System*, the same which your Manual recommends, and which in fact, has been followed in this country for more than 70 years. The author is the Chevalier von Heint, an Austrian nobleman, the owner of large

estates in the imperial dominions. He appears to have completely succeeded, by following this simple American method, and he even ventured to raise silk worms on mulberry trees in the open air, on the frontiers of Hungary, in 44° N. Lat.; and he assures us that he met with the same success.

On the subject of reeling the silk from the cocoons, I think it is an art to be acquired only by practical instruction and experience. It is not to be learned from books alone. The description, however, which you have given of its process, is in general correct, and has been with propriety inserted. It may lead to some useful experiments, and will diffuse, at least, the knowledge of the theory of the art. The present method of reeling silk in Connecticut, will not be long, I believe, persevered in, after a better one shall have been generally introduced. It is well, however, to record it as a matter of fact, and for the benefit of those who still choose to pursue it.

Upon the whole, I consider your work as a good practical directory for American farmers, and as a fair and judicious execution of the duty committed to you.

I am, with great regard,
Dear Sir,
Your obedient servant,
PETER S. DU PONCEAU.

JONATHAN H. COBB, ESQ.

New York, June 29, 1831.

I have read the work of Mr Jonathan H. Cobb on the Culture of Silk, which is intended by him for a popular manual of instruction, and have been much pleased to find that it unites brevity with all the most important precepts required in that valuable branch of domestic produce. It is also clear and lucid, and free of all accessary details, little to be called for within the short period of time necessary to make a silk crop. It is evident that Mr Cobb has been many years a practical culturist, and could also embrace the interesting

cares of the filature even further than that of making marketable raw silk, which is not frequently attended to by silk growers. It is on this principle only, meaning that of dividing among various branches, hands and stages, all the operations required for the cultivation and manufacture of silk, that national wealth from this rich produce can be depended upon. One only individual cannot be a perfect operative in all stages and divisions of the art, but he can become skilful in many or several of them, if at each degree he command a marketable produce. I conclude with observing that the work of Mr Jonathan H. Cobb deserves the confidence of the public, and its circulation should be encouraged.

FELIX PASCALIS, M. D.

PART I.

CULTURE OF THE MULBERRY TREE.

THE only appropriate food for the silk worm is the leaf of the mulberry tree. It should be the first business therefore of the silk grower to provide himself with the source of a constant supply of mulberry leaves. The greater his supply of this article, the greater will be his crop of silk, as the eggs of the insect are procured to any amount with ease and cheapness. Having the eggs of the insect and a sufficient quantity of food at hand, ordinary care on the part of the proprietor will insure a good crop. It is now abundantly proved that there is no great obstacle in the soil or climate of these United States to raising silk to a vast amount. As there is a difference in the quality of the mulberry leaves for raising silk, it should be the object of the cultivator to propagate the best kind. The white mulberry* has been found superior to the purple or native red,† and the plants are easily produced from the seed.

* See the leaf, Fig. 1, Plate 2, reduced to one fourth its natural size.

† See the leaf, Fig. 2, Plate 2, reduced to one fifth its natural size.

THE SEED OF THE MULBERRY.

One ounce of good seed will be sufficient to produce 5000 trees. The seed is easily obtained from the fruit in the following manner. When the fruit begins to ripen, every morning the tree should be shaken and the fruit that falls gathered with that which had fallen before; if enough is not gathered in one morning, several successive gatherings may be collected; but the fruit should not be kept over three or four days before the seed is extracted, which may be done by putting the fruit into a tub and mashing it till the berries are completely worked into a common mass. Then pour water into it and stir it briskly, and the pulp may be separated from the seed. Then pour off the water, with all the seed that floats, (for that is worthless) and renew the washing till the seed is clean, when it may be drained, spread out on cloths and dried in the shade. When perfectly dry it should be put into a tight vessel and kept in a dry place. It should never be exposed to the light, air or dampness more than is absolutely necessary. The seed may be obtained at a reasonable rate at most of the seed stores, and I have bought it in Mansfield, Conn. at the rate of a dollar per pound.

SOWING THE SEED, CHOICE OF SOIL, ETC.

A soil rich, warm and mixed with much mold, is recommended as the most proper for a nursery of mulberry trees. New shoots should have ground easy to penetrate. The ground should be ploughed the preceding

fall, and again ploughed two or three times in the spring and made light and friable; two or three dressings of manure well ploughed in would be of essential service; the ground may be levelled with a hoe or rake and the seed sown in drills about the first of May, much in the same way as our farmers sow carrots. The weeds must be carefully destroyed, and in dry times watering will be beneficial. I have sown the mulberries in July, and they have sprouted and come on rapidly; but the frosts of winter in our climate (New England) have been too severe for them. I would recommend to sow the seed in the spring. From a quarter of an acre of ground the last season, I had over 10,000 plants, produced from seed sown in the spring in the way above-mentioned, some of them upwards of a foot in height. Those that are intended for transplanting may be taken up in the fall and put out of the way of frost in a cellar, the roots being covered with loam. Those left standing may be covered with light manure or old hay. The frost will be apt to kill the young and tender tops, but the shoots will start from the bottom in the spring with great luxuriance. The seed plant is undoubtedly best, both for food for worms and duration: it is also the most convenient mode of getting the trees, as seed enough can be sent by mail to any part of the Union to produce an orchard sufficient to feed several millions of worms. I cannot believe that any other mode can be pursued to much advantage in this country; but as some may be fond of trying experiments in other modes of culture, the following are laid down as sometimes used in Europe.

MANNER OF MULTIPLYING MULBERRY TREES BY CUTTINGS.

The soil chosen to receive the slips of the mulberry tree should be prepared much in the same way as ha been described for the seed. The cuttings of the mulberry are to be planted in the same manner as the cuttings of the vine; that is, by making furrows by a line at the distance of six feet from one to the other, and by crossing them by furrows at the same distance, in order to form squares. A two year old branch of a mulberry tree, having wood of four or five years at one end, must be selected, and the extremity of the old wood must be interred to the depth of about ten inches. The branches chosen from the white mulberry must be taken off in the spring at the first rising of the sap. Two or three incisions must be made in the joints or knots of the old wood, because this operation will facilitate the shooting of the roots, which always put forth from the joints of the old wood. The cuttings must then be covered with a well manured and friable earth, and the end of the branch which rises from the soil must be cut off at the third bud from the surface. If rains should not frequently occur after the plantation is finished, it would be necessary to water the plants often. The multiplication of mulberry trees by means of cuttings is said to have the important advantage of two years in advance over the establishment of a nursery by means of seed in Europe.

BY LAYERS.

To make layers is to force a branch or a shoot of a tree or of a shrub to become itself a tree or a shrub, by putting

a branch or a shoot into the ground without separating it from the parent tree. The spring is the most suitable season for this operation. The shoots which arise at the foot of a tree, the youngest smooth branches found about the lower part of the mulberry, any other branches that are long and supple enough to be secured in the ground, and lastly, the shoots of a young tree whose trunk is not high and which may be laid easily, may be used. If there arise some vigorous shoots at the foot of a mulberry tree, a hole must be dug six or eight inches deep near each shoot, into which the shoot must be laid without twisting it or separating it from the tree. It is then to be secured in its place with crotchets of wood and covered with good mould, which must be pressed over it, and the end of the shoot which rises above the ground must be cut off above the second bud. It will be further necessary to place by the side of the layer a stake to mark the place and prevent its being trodden. It must likewise be watered immediately after the operation, and as often afterwards as may be necessary to maintain about it a proper state of moisture.

The young and smooth twigs among the branches of the mulberry may be passed through a basket or vase perforated at the bottom and filled with earth well manured. The twig must be cut off four or five inches above the vase or basket, and the mould kept in a due state of moisture by frequent waterings.

When a mulberry tree is well spread and the boughs nearest the ground have not been lopped, some of the branches at the distance of six feet from each other may be bent down and secured in the ground, so that the ends shall not rise more than six or eight inches above the surface.

All the layers made in these different ways may be separated from the parent tree in the autumn of the second year. They may be cut off four inches from the parent trunk, be taken up carefully with their roots and small fibres and placed in the nursery or permanently established in an orchard. In the nursery they may be set at the distance of six feet from each other and in the following year, by heading them down, four or five layers may be made from each. By these means one hundred trees may be increased in four years to eighteen hundred; for the parent trees, after the layers are separated from them being replaced in a straight position, secured to a prop, manured, and watered, generally retrieve their strength and make productive trees.

TRANSPLANTING FOR HEDGES.

After standing in the nursery a suitable time, the trees may be transplanted for making hedges. I prefer transplanting in the spring. Great care should be taken to preserve the very fine roots. If hedges for fences be wanted, the young trees may be taken from the seedlings of the last year. The white mulberry forms an excellent live fence, and when once established is probably the most permanent of any other Cattle must not be allowed free access to the hedge while young, as they would destroy it altogether; but after it has become a good fence they may approach it with advantage. The more it is broken and lacerated by cattle, the more impenetrable it will become; as for every branch broken, a half dozen shoots will immediately start out, till the bush forms a perfect bramble. This mode is therefore recommended

as accomplishing three important objects: supplying food for silk worms; keeping the trees low, that the leaves may be gathered from the ground by children, and furnishing a good and almost never ending fence. In transplanting young trees for hedges, they should not be pruned; but the second year or at least the third, the tops should be cut off and the side branches trained laterally with the hedge by interweaving them.

SETTING OUT STANDARD TREES.

It is an axiom in rural economy, that the greater the disbursement in improving the land the greater will be the proportional income. The land where the trees are to be set, will be much better for the purpose if ploughed, harrowed and manured. The trees may be three years old if taken from a rich soil, or four if from a poor soil; they should be from four to eight feet in height, and at least an inch in diameter. The holes should be dug at about the same distance from each other as for setting apple trees, and be made eighteen inches deep and three or four feet in diameter. The bottoms of these holes may be covered with a few inches of fresh mould. The young tree should be placed in its proper range, ascertained by a stake at each extremity of the line, and it should be held there till its roots are well covered with friable and well manured earth, free from stones, and must be well trodden down and watered if necessary; a small cavity round the stem to retain the rain is very proper. Two or three dressings a year with a hoe and manuring occasionally may be of essential advantage.

GRAFTING AND BUDDING.

In grafting it is essential to adapt the bark of the scion at its extremity to the bark of the stock, and to place the scion on the northerly side in order that it may be less exposed to be withered and dried by the sun. Budding should be performed with the same care as in other fruit trees in order to insure success. But these and many of the modes of improving and propagating the mulberry which have been resorted to in Europe, will be unnecessary in this country. With us, land is so cheap and labor so high, that the easy and convenient mode of propagating by seed will be chiefly resorted to, and no essential permanent advantage will result to us from grafting or budding, except in propagating the rare varieties.

PRUNING.

The imperfections in the form and growth of the trees may be remedied by a judicious pruning, once in two or three years; and with regard to that, the good sense of every cultivator will direct him how to form a tree the most beautiful, as well as the most productive. June is the best season for doing this, and the young branches that are taken off will afford their leaves for the worms.*

* For taking off the small branches of larger trees which could not be reached by hand, I saw an ingenious contrivance at Baltimore by G. B. Smith, Esq. It was nothing more than a pair of pruning shears attached by one of the handles to a ten foot pole, which is held in one hand, and operated upon by means of a cord passing through a pulley, and attached to the other handle with the

GROWTH OF THE MULBERRY TREE.

Standard trees, when once well rooted, will thrive in any soil that is not too wet; the gigantic size to which the wild native mulberry attains in the western country, and numerous examples of large and thrifty trees in the Atlantic states, furnish abundant evidence of this. The mulberry tree attains to a very great age, and no other tree of equal growth and beauty resists so well the influences of the sea atmosphere. Two or three grand specimens of this beautiful tree, says Mr Phillips, standing on the most exposed situation of the northeast coast of England, not only defy the enemy, but delight intheir situation: throwing out their noble limbs in all directions, and assuming a foliage rich, full, and tufted to its topmost boughs: one of them is of the greatest magnitude, though some of its vast limbs have been torn from it; it is still in vigor, and in point of richness of effect, the oak itself is scarcely superior. They are abundantly prolific. The red, or, as it is more commonly called, the purple mulberry, is considered as the only species indigenous in this country.* The northern extremity of Lake Champlain is, according to Michaux, its most northern limit. It is found in all the states of the Union, south and west, and Dr James found it as far west as the river Canadian.

Everything is useful in the mulberry tree. Its leaves

other hand; by this simple contrivance the twigs and branches were taken off with ease, and so smoothly as not to lacerate the bark and injure the appearance of the tree.

* See the leaf in Figure 2, Plate 2.

are valuable in the silk which they produce by nourishing the silk worm ; its fruit is excellent for poultry, and the wood is useful for the joiner and for fuel. The mulberry tree may also serve as an ornament to our gardens and streets, very different from the Lombardy poplar, which harbors a loathsome insect, or the elm, or the ash, which are barren and do not afford so thick a shade ; and as this tree is always handsome and useful, the Author of nature has been pleased to add cleanliness, as on account of the acrid bitterness of its sap but few insects will harbor upon it.

The first mulberry tree that was planted in France was near Montelimart, and nearly three centuries after (in 1802) the original tree was still in existence.

In England it was first planted in the year 1548 ; Mr Phillips saw at Sion House the original trees. He found their interior so decayed that the timber crumbled on being touched : the propped branches were nevertheless so well nourished, that the fruit and foliage were not inferior to those of the youngest trees. Of the plantations formed during the reign of James I. many venerable remains are still seen in England. Mr Phillips found a black mulberry tree in a garden adjoining Greenwich Park, which is supposed to be one of the oldest in England. ' It throws out,' says Mr P., ' ten large branches so near the earth, that it has the appearance of half a score of large trees rather than one, and notwithstanding many of the projecting branches have been sawed off, it completely covers a circumference of one hundred and fifty feet ; and although the elder trees have fixed their abode in some parts of the trunk and other parts are covered with ivy, it continues to give shoots as vigorous

as the youngest tree and produces the finest mulberries in England. It is a regular bearer, and the gardener assured me that he gathered more than eighty quarts per day during the season.

THE CHINESE MULBERRY.

Besides the varieties of the mulberry tree heretofore mentioned, there is one, which, if we may believe the recommendations of it, is superior to all others for the culture of silk: I mean the Chinese mulberry.*

The following account of it I derive from the second No. of the Silk Culturist, a valuable and useful work, published by Dr Felix Pascalis, of New York. It is contained in a letter to the author from Havre.

'Samuel Perrottet, a member of the Linnæan Society of Paris, employed by government as a travelling botanist, returned to this port after a voyage of thirtyfour months. He brought with him eightyfour boxes of various dimensions, containing one hundred and fiftyeight species of living plants, of at least eight feet in height, to the quantity of five hundred and thirtyfour individuals. All these productions had been procured in the seas of Asia, or gathered on the coast or in the lands of Cayena. From the commencement of the present century, there had never before been so vast an importation — one so extensive in number, for rare genera, species and families, and vegetable productions, or of their seeds. All of them passed under my examination, and they rather appeared to have come out of a green house than from a ship.

* See the leaf in Fig. 3, Plate 2, reduced to one twelfth of its natural size.

'In this immense collection was the *Morus multicaulis*, thus called by Perrottet, for the first time ascertained to be the real Chinese mulberry, *Morus alba sinensis*, of which every silk grower and culturist should endeavor to multiply the species. It has been deposited in the Royal Garden. Monsieur Perrottet says that it grows with many shoots from the roots, with tender stems and large foliage, of a much more nourishing nature than the European mulberry.

'Chinese inhabitants assured him, that to this tree the disciples of Confucius are indebted for the prosperity and solidity of their empire.

'The *Morus multicaulis* is already propagating in many parts of France, and probably will be substituted and preferred to all the other varieties. Among the other qualities of the plant, it is affirmed in China that a less quantity of this foliage is required for the precious insects than of that which we are obliged to provide for them. Monsieur P. has left the tree in Cayena, where it is now flourishing in dry and barren soils.'

I have received half a dozen shrubs from Mr Prince's Nursery on Long Island, which comprise six different varieties of the mulberry, one of which is the Morus multicaulis, and Mr Prince writes to me that he has them for sale.* During my late visit to

* I have seen a few of the plants of the *Morus multicaulis* in the Kenrick Nursery at Newton, which were transplanted from Mr Prince's the present season, and are now in a flourishing condition. Our nurserymen will find it for their interest to propagate this plant as extensively as they can for the present, by inoculation and grafting.

Madame Parmentier's Nursery at Brooklyn, N. Y., I saw several hundred of these plants which looked very thrifty, bore very large leaves, seemed to take well to the soil, and grow with uncommon rapidity. I picked several leaves from them, each of which more than covered the crown of my hat. The leaves were given to the silk worms in my presence and were devoured by them with great avidity. This lady has also twelve different varieties of the mulberry in her nursery, but this seems to be fast taking the place of all others.

Mr Richard K. Haight, an intelligent merchant of the city of New York, has one hundred of these plants, which were imported from France the present season, which I saw in his nursery at Brooklyn in a flourishing condition. He has also some Chinese mulberry trees of a different character, which he has imported with great care and which may prove upon experiment to be valuable. I have brought this valuable plant into Massachusetts and intend to inoculate some thousands of the common white in my nursery with buds the present season if possible.

The following statistics of a mulberry orchard of two acres, are by the late Andrew Parmentier, Esq. of New York :

650 standard trees in the low parts of the ground, each 20 feet apart.
250 standard trees on the rising places, 12 feet apart.
650 dwarf trees on suitable portions of the ground.

1550

This ground to be fenced by mulberry hedges. The purchase money for about two acres, with cost of manure and necessary tillage, is estimated at $500.

Supposing that to secure full success to this orchard by using none of the foliage, and tilling and replacing dead trees during five years, counting loss of interest and other expenses accruing, we have an increase of debt of $375, and a capital of $881; but commencing from the fifth year up to the twentieth of its existence, the author of these statistics forms three different periods of five years each. The plantation will give in the first period from 90 to 95 quintals of foliage, that is, 9000 lbs. or fodder for five ounces of worm seeds; 35 pounds of silk, about $180, that is, 20 per cent on $881. The second period will annually afford for fourteen ounces, 15,000 quintals or 95 lbs. of silk, equal to 47 per cent on $881. But the third period to the twentieth year of age of the orchard, from 500 to 650 quintals may be expected, which will feed 28 ounces and give 196 lbs. of silk, worth nearly $1000, or more than 112 per cent.

Admitting however that each crop of silk costs some expense, which in no way whatever could be one quarter or one third the profits, these latter are so secured and so considerable, that the undertaking would prove in the highest degree useful and profitable.

PART II.

ON REARING SILK WORMS.

The silk insect affords a display of the wisdom of Divine Providence in the adaptation of means to ends, calculated to excite high interest and admiration.

The extraordinary effect produced by this little animal in the short space of six weeks is no less than the conversion of the vegetable substance of the mulberry leaf into threads of rich and durable silk. Well might the Emperor Justinian be astonished to find that the rich and beautiful material of his magnificent robes was first produced and worn by this feeble insect ; and well might he repay with munificence the monks by whose exertions the eggs of the silk worm were smuggled in a hollow cane from India to Constantinople. This hollow cane was the ark whence came out the germ of those numerous tribes of this insect which have spread over the whole of Europe, and whose descendants are now fast settling in these United States. Let us commence with the eggs of this insect, and trace its operations, its wants, and various changes, till it forms the cocoon, from which proceeds the moth, which in its turn produces the egg.

THE EGGS.

The eggs are of small size.* When first laid, they are of a pale yellow color, but in three or four days turn to a light slate color, and subsequently to a dull brownish slate color. Those which remain yellow have not been fecundated, and of course are worthless. The most proper place for keeping the eggs until they are wanted for hatching is a dry cellar. They should be kept in a tight box, to protect them from mice or insects, and dry, so that the mould and mildew may not injure them.

THE HATCHING, LEAVES, ETC.

The advance of the season determines the time of hatching the eggs. As soon as the leaf of the mulberry begins to unfold — which is generally in this climate (New England,) the latter part of May — and you observe that there is a prospect of having a sufficient quantity of food, it is time to expose the eggs to hatch. No other process is necessary than to expose them to the air in a room; they hatch voluntarily in a day or two after the exposure. Various modes are adopted in Europe — hatching them in ovens, carrying them about the person, &c, — but nothing of that kind is necessary here.

It is best to preserve those insects for rearing, that come out as nearly at the same time as possible. As soon as the worms begin to appear,† lay over them young and tender mulberry leaves; they will soon attach themselves to the leaves and by taking hold of the stems of the

* Vide Figure 1, Plate 1.
† See Figure 2, Plate 1.

leaves you may remove them easily. They ought now to be supplied with fresh tender leaves three times a day. As the leaves when very young will dry so much in a short time if exposed to the air as to be unfit for use, you may put them in a glazed vessel or keep them covered in a cellar or cool place; by which means the leaves may be kept good for two or three days.* Besides, it is well to have always in your house at a time, a stock of leaves sufficient at least for three days' provision for your worms in case of wet weather. If leaves are given when wet they will cause disease. Be careful never to pull the leaves when wet, either with rain or dew, except on absolute necessity, and in that case you must spread them and turn them, that the leaves may be perfectly dry before you give them to the worms; rats, mice, spiders, ants and fowls are very destructive to the worms; care must be taken therefore to keep them out of the way of all such enemies.

THE NURSERY, SHELVES, ETC.

In Europe laboratories have been constructed with great care and expense; but however convenient these may be, they are by no means necessary to success in rearing silk worms; almost any building will answer for that purpose. I have reared them myself with success in a barn, in my cellar kitchen, and other rooms of my dwelling-house, and in the lower story of Tremont House

* Mr D'H. proposes the following method to preserve leaves: Put them under cover on a brick pavement, or gravelled floor; turn them over and place them further where it is not damp (for they always leave a dampness where they lie) three or four times a day or an hour before you feed the worms; you may thus keep them three or four days. The leaf wants air to keep fresh.

in Boston. It was found in France that the cocoons brought to market by the peasants, raised in hovels so full of cracks as easily to be seen through and to admit the air freely, were richer and heavier than those reared in palaces and in the confined rooms of dwellings in cities.* The apparatus of the Rev. Mr Swain, I should think might be worth adopting, for those who are beginning on a small scale; in fact I have had something like it constructed for my own use. This apparatus consists of a wooden frame, four feet two inches high, each side; sixteen inches and a half wide, divided into eight partitions by small pieces of wood, which form grooves in which the slides run, and are thus easily thrust in or drawn out of the frame.

The upper slide is of paper only and designed to receive the worms as soon as hatched; the others are of wicker work, the opening being about a quarter of an inch square; under each of these are slides. This occupies little space and is neat, and the persons using it can easily remove the litter. I have used three tiers of rough pine boards fixed upon upright posts, about four feet in width, one above the other, with a space between of two

* I saw at Philadelphia on the 21st of June last, worms raised by Mr D'Homergue in a yard of mulberry trees, which bore heavy rains and thunder storms, as well as cold windy days, a few of which spun in 30 days and produced excellent cocoons. They began to meunt 32 days after hatching. I also saw a few worms raised from eggs which were laid on the outside of a brick wall in a northern exposure, which had stood all the severity of the winter. I saw many thousands of excellent cocoons raised by Mr Du Ponceau under the care of Mr D'Homergue in the heart of the city of Philadelphia. I tried some on trees in the open air the present season, but they did not succeed; they obtained however to a considerable size, but the frequent rains destroyed them.

and a half feet, affording room sufficient to pass all round the frame, so that I could conveniently reach any part of it. In making the shelves, it is well to have the lowest one six inches broader than the one above it, and to make the same difference in the other shelves above, so as to break the fall of such worms as happen to tumble down. A good form for the shelves is that adopted by Mr J. Y. Tomkins of Baltimore, and which I saw in the nursery of Gideon B. Smith, Esq. of that place. It is about 2½ feet wide, by five or six long, made of thin boards, with a piece two inches wide nailed flat on the upper edge along the sides and ends, with legs about a foot long in the corners. The legs do not pass through the table, but leave a part of the hole on the upper side for the feet of another table to set in. Thus contrived five or six of these tables are set one above another, and are taken down, cleaned and again set up with facility. One of these shelves will accommodate 500 worms.* It might be as well to put old newspapers on the shelves, which might be taken off whenever it was necessary to clean the worms, and then replaced. — Thus I have done.

THE DIFFERENT AGES, MOULTING, ETC.

There are several varieties of silk worms.† The most common varieties change their skins four different times. These changes are called moultings, and the intervening

* Farmers, however, who would make it profitable, should raise one or two hundred thousand, and rough boards will make the cheapest and most ready shelves for use on an extensive scale.

† I saw in the Nursery of Gideon B. Smith, Esq. of Baltimore four different varieties. I would recommend, as most profitable for rearing, the large white.

times the different ages. The time requisite for the several changes depends greatly on the temperature. If the weather is warm, they will generally happen as follows : the first moulting on the fourth or fifth day after the hatching ; the second begins on the eighth day ; the third on the thirteenth and fourteenth days, and the last change on the twentysecond.

The fifth age lasts about ten days ; at the end of which the worms have reached their ultimate growth, being three inches in length,* and are prepared to spin their cocoons. Thus thirtytwo days intervene between the hatching and the beginning of the cocoon, and I have known the period retarded to sixty days. These changes will only be noticed by accurate observers.

FEEDING, CLEARING THE LITTER, ETC.

Too many leaves should not be given to them at once, and the leaves given should be spread very thin, because if put on too thick, a great number of the worms when small will run the risk of being lost and carried out among the litter. When the worms are in the first age, you need only clean the litter once or twice, as you find it necessary. During the whole of the first age, the leaves of the young plants of the mulberry, as being the tenderest, are preferable to the leaves of older trees for the food of the young worms. It is well therefore to sow some mulberry seed every year so as to have a succession of young plants. During the temporary sickness produced

* See Figures, 2, 3, 4, 5, or the different appearance of the insect in its different ages.

by the changing of the skin they should be fed with a very sparing hand. The signs by which it is known that worms are sick and about to change their skins, are these : they hold their heads up, are motionless and appear to sleep ; — this should be noticed.

During the second age it is advisable still to continue to feed your worms with leaves from the young plants, as they are still preferable for them. You must now begin to be attentive to clear away the litter from time to time, so as to prevent all danger from its heating, which proves highly injurious, though some people never clear away the litter at all. These insects are remarkably fond of cleanliness, which besides helps to enliven them and gives them a keen appetite for the leaves that are given them. The litter is taken away in the following manner ; you scatter some fresh leaves upon one corner of the shelf. to which the worms having attached themselves, which they will readily do, you thentake up the worms by means of the leaves and stalks they cling to, leaving the litter underneath. Having thus taken up all the worms from that corner and placed them in a clean place, you then clear away the litter from that corner and carefully sweep together with a little broom or wing all the dirt, which you remove entirely : you then remove the worms next adjoining to the clean place thus prepared and put them into it ; in this manner you proceed with the rest.*

During the third age the full grown leaves of the

* If the worms are laid on a newspaper, it is easy to take out the newspaper, lay it on a table, and transport the worms, who generally adhere to the leaves and branches, to another newspaper, which is put on the shelf after sweeping it. The litter on the other one may then be thrown away.

largest trees may be given — though it would be well to reserve the largest and toughest leaves till the last age, when they are the most voracious. During the third age, the litter should be removed at least three or four times; worms that die or appear to be diseased should be immediately removed.

The same treatment will be required during the fourth and fifth ages as in the preceding. As they advance in age the greater will be the proportion of food required and the oftener the litter must be removed; by these means the process is sooner brought to a conclusion, and the worms always kept in high health and appetite. During the four or five days previous to their rising, the worms consume an incredible quantity of leaves, eating with great voracity, and at this time the labor of tending them is most fatiguing. You will know when the worms are ripe or ready to rise and form their cocoons by observing them with attention when you give fresh leaves. Those that are ripe, instead of eating, avoid the fresh leaves, and run over them as fast as they can wander about, and try to climb; they will look transparent, of the color of a green gage plum, and somewhat diminished in size.

In the fifth age the worms should have new leaves as often as the old ones are consumed, until they are observed to creep on the leaves without eating. At night they should have a double portion.

PREPARATIONS FOR THE COCOONS.

Previous to the rising of the worms, some little arches or cabins should have been prepared of brushwood or broom corn, by setting their branches with their top

spread, pressing against the bottom of the upper shelf to hold them in their position. The worms will readily find and climb these little trees and spin their cocoons in them; the worms will be three or four days spinning their cocoons,* and they will all generally be finished in eight days. The brush may then be taken down, the cocoons taken off, cleared of the loose tow and prepared for reeling. I have found that the branches of the oak, with the leaves on, answered the purpose for these arches very well, as the leaves are strong and do not crumble in taking off the silk. They should be cut some days before hand, and be dry when used. Some prefer to have the brushwood, entirely stripped of its leaves. Mr Smith, of Baltimore, uses and recommends the broom corn.

SEED COCOONS.

Those cocoons that are intended for seed may be stripped of their tow and strung upon a thread — care being taken not to pierce entirely through the cocoons — and

* Dr Pascalis of New York, a gentleman of great literary reputation and high scientific attainments, has by the use of Electricity been enabled to hasten the progress of silk insects; and worms reared by him, to which this powerful agent was applied, have spun their cocoons in 27 days from the time they were hatched. I have never made any experiments in this way myself, but doubt not that this, as well as many other improvements will be introduced. The same gentleman has also recommended in his valuable work, the Silk Culturist, (No. 2, page 105) artificial mounting slides, upon which the worms may mount and spin their cocoons. Those who have curiosity to see these improvements, will find a drawing of them in the work referred to.

* See the Cocoon, Fig. 7, Plate 1.

hung up until such time as the moths come out,* which will be in one or two weeks, when the males and females will couple ; they may be taken by the wings in pairs without separating them and placed on large sheets of paper, (old newspapers will do,) where they are to remain ; as many pairs of moths as can conveniently lie on the papers may be placed there. The room in which these are placed should be secure from mice and ants, and the sun should not be permitted to shine on them in any stage of their existence ; as soon as the moths on one sheet have done laying their eggs, it should be folded up and put down cellar, or in some cool, dry place until wanted for use the next spring.

The moths (see fig.) are in the form of a grayish white butterfly and generally begin to lay their eggs in 24 to 36 hours, after leaving the cocoon. Each female moth will lay from three to four hundred eggs, generally handsomely disposed and firmly attached to the paper in a circular form.

Should the eggs be permitted to remain exposed to the warm weather, they will sometimes hatch the same season, and unless another crop be desired, they will be lost. The moths eat nothing after leaving the cocoons, and die in a few days after depositing the eggs.

DISEASES OF SILK WORMS.

The foreign writers enumerate and describe a variety of diseases to which silk worms are liable in their differen ages, and particularly in the fifth, which all agree to be the most critical. But to all these diseases they prescribe the

* See the Fly, Fig. 8, Plate 1.

same means of prevention and the same remedies when they have occurred. It is therefore unnecessary to describe their various symptoms, as it would lead to no good practical result.

The diseases of silk worms generally arise from the want of sufficient air and space, from their not being kept dry, and being fed with damp leaves, and also from their not being kept sufficiently clean, particularly in the fifth age. The fermentation of their litter, the dampness and the bad air which it occasions, are the most frequent causes of mortality among them. The greatest care therefore should be taken to keep them constantly clean and dry, and to give them a sufficient quantity of space and air; a current of air in fine warm days, should always be let into their nursery. If, notwithstanding all the care taken, some general sickness should declare itself among them, the remedy recommended by the writers, is, to give them a change of air, by transporting them into another room. But this may not always be convenient. It is with these animals, as with our species, easier to prevent diseases than to cure them. If nothing better can be done, the diseased worms must be thrown away. The chloride of lime and soda have been used with good effect in some nurseries to cleanse the air.

Before the worms begin to mount and spin their cocoons, they void themselves of their excrements, and they generally do it on or near the edge of the board on which they are placed. Those who have not strength enough to cast off their excrements, die in the attempt, and in the morning numbers of them are found dead. They should be carefully taken up and thrown away. When many are found in that condition, it is a sign that the litter is fermenting and that a cleaning is necessary.

It is possible that there may be diseases of the silk worms peculiar to the climate. Experience will enlighten us on the subject. I have heard that ladies in one of our Southern States have lost all their worms this year, from the *plague getting in among them.* It is certain that there are epidemic disorders by which whole nurseries of silk worms are sometimes destroyed. But these are of rare occurrence in our country; and it is hoped that they may be prevented by careful attention to the rules prescribed.

CURING THE COCOONS.

Were it possible to wind off all the cocoons before the insect naturally pierces them, it would be best to do it, because the silk at that time winds off with greater ease than afterwards. But as this is sometimes impossible, and often inconvenient, various methods have been devised to stifle the chrysales in the cocoons. This may be done by placing them in an oven, moderately heated, or in the steam of boiling water; even the sun is sufficient for this purpose in southern latitudes, by acting upon them several days. I have used the first method with success. The oven being moderately heated, the cocoons were spread out, in oblong baskets eight inches deep, in box covers, pans, &c, and permitted to remain in the oven half an hour. In being cured they lose about twentyfive per cent in weight. Mr Smith of Baltimore says, he has found the following method preferable to any other, and that the object is perfected without danger of injuring the silk. I put the cocoons, says he, into a tight tin vessel with a cover, closely fitted, and put this vessel into another a little larger, containing such quantity of water as will nearly fill it, when the other is put into it.

Fire is then applied, and the water kept boiling, half an hour or more, according to the size of the vessel, and until the cocoons in the inner vessel shall have become as hot as the boiling water. The cocoons are then spread out in a dry room, that the moisture may evaporate After this operation, the cocoons are ready for the reel or for sale.*

SPACE REQUIRED FOR SILK WORMS.

It is calculated that the worms proceeding from one ounce of eggs, which in numbers are estimated at 35 to 40,000, should have a space on the shelves,

	squ. ft.	in.
In the 1st age of - - - -	7	4
In the 2d age of - - - -	14	8
In the 3d age of - - - -	34	10
In the 4th age of - - - -	82	6
In the 5th age of - - - -	183	4

As a general rule they ought not to touch one another.

QUANTITIES OF SILK YIELDED BY VARIOUS PARCELS OF COCOONS.

Eight pounds of cocoons (16 ozs. to the pound,) produced from 16 to 18 ounces of silk, 6 to 9 cocoons to the thread. Mrs Williams obtained nearly one ounce and a half, from 244 cocoons.

Miss Rhodes had on an average one ounce from 244 cocoons.

The estimates of the number of worms to make a pound of spun silk are various.

* This might do, perhaps, for a small quantity of cocoons, but I think for a large one, it would cost too much, and give too much trouble.

Mr Storrs, of Conn. says 4000; Mr Tufts, of Dudley, 3000; Mr D'Homergue says 2400, of 350 to a pound, the moth not stifled.

I should say the last estimate was the most correct, and even a less number will produce a pound if they are well taken care of. I have had three pounds from 8000 in one season including floss.

WEIGHT OF COCOONS.

Two hundred cocoons, from worms raised in the early settlement of Georgia, weighed a pound. In Pennsylvania, 306 cocoons from worms fed by the late Mr Busti, and from 490 to 600 in the establishment of Mr Terhoven, weighed a pound.*

It is very evident that there is a great difference in the weight as well as the quality of cocoons; and the quantity required to make a pound of reeled silk. This may depend upon the different variety of the worms or the greater or less care in nursing them.

*Mr Pintard of Philadelphia, has raised Silk Worms from eggs produced on Messrs Terhovens' farm, 335 of the cocoons of those worms, chrysales not killed, weighed one pound. Mr D'Homergue aided him in counting and weighing them.

Of the cocoons raised in Philadelphia by Mr D'Homergue the present year, which I saw, the eggs were partly from South Carolina and partly from France; the former were large and were found when weighed, to contain 337 to a pound. The French cocoons were small, and 387 weighed one pound. The chrysalis not stifled and the cocoons just gathered.

Of cocoons raised in Massachusetts, by Mrs Davenport o Milton, from eggs furnished by me, and tended agreeably to my instructions, 206 weighed one pound, before the chrysales were killed, and 407 weighed two pounds.

The following calculation of the labor attending and connected with the culture of silk, is by John Fitch, Esq. of Mansfield, Conn. and is taken from the Manual publisher by order of Congress. One acre of full grown mulberry trees, set one and a half rods apart, will produce 40 pounds of silk.

The labor may be estimated as follows:

For the three first weeks after the worms are hatched, one woman who is acquainted with the business, or children who would be equal to such a person.

For the next twelve or fourteen days, five hands or what would be equal to five if performed by children. In this period two men with other help would be employed to better advantage than all women and children. This period finishes with the worms. For picking of the balls and reeling the silk, it will require about the same amount of labor for the same length of time as the last mentioned period, which may all be performed by women and children. The aforesaid labor and board may be estimated at eighty dollars; spinning the silk at thirtyfour dollars; forty pounds of silk, at the lowest cash price is worth two hundred dollars, which makes the following results.

40 pounds silk at $5 per pound - -		$200, 00
Labor and board - - - - -	80,00	
Spinning - - - - - -	34,00	
		114,00
Net profit per acre		$86,00

The principal part of the labor may be performed by women and children. But when the business is carried on to a considerable extent it is considered more profitable to employ some men for the last period of the worms.

COST OF RAISING SILK WORMS, BY MR D'HOMERGUE.

Four ounces of eggs, each ounce containing about 35,000 eggs, making, in all, 140,000 eggs.

If the mulberry trees are on the farm where the eggs are raised, two women are sufficient to gather the leaves, until the fourth moulting. The worms should be fed three times a day, and cleaned once after each moulting.

In the last ten days additional help is necessary, as the worms require more frequent cleaning, in consequence of the greater quantity of leaves which they consume; and to prevent fermentation, and consequent sickness, more attention is required at this time.

Mr Du Ponceau has raised seven ounces of eggs with only the labor of two persons, and these not employed the whole of each day, except on the last ten days, and some occasional help, who were employed to bring leaves from the country, two miles distant. In the three first weeks, one person could have done the whole business, except gathering and bringing the leaves. This was done in the city of Philadelphia.

The following is the calculation of Mr D'Homergue.*

An acre contains 45,537 square feet. 1500 mulberry trees, six years old, will produce each 30 lbs. of leaves, which makes 45,000 lbs. An acre will contain 1500 mulberry trees, planted at the distance of twelve square feet from each other. This is in case it is wished to grow corn or wheat in the intervals between the trees. But if the ground is to be devoted to mulberry trees alone, 3000 trees may be planted on an acre at six square feet distance, and these at six years old will produce 90,000

* It is evident that Mr D'Homergue does not mean the English one.

lbs. of leaves. Selling the leaves at half a cent per pound, the purchaser gathering them, or at one cent per pound delivered to the purchaser, would produce in the first case $900, in the latter $450.

According to the calculation of Dandolo, which appears exaggerated, 90,000 pounds of leaves, at twentyone pounds of leaves for one pound of cocoons, would produce at least 3700 lbs. of cocoons, which, at twentyfive cents per pound (the moth not being stifled,) would produce $925. After killing the chrysalids, the cocoons will produce a higher price, say thirty, forty, or perhaps fifty cents per pound, according to the quality and the abundance, or scarcity of the articles, and the profit will be proportionate.

The said 3700 pounds of cocoons, being good and well reeled, will produce, at eight pounds of cocoons for one pound of silk, 420 pounds of the raw article, which at $3 per pound, the price China silk sells for in our seaports, will amount to $1260; and if perfectly well reeled and suited to the European market may produce $2520, at the rate of $6 per pound.

PART III.

REELING AND MANUFACTURING SILK.

In Europe, where the divisibility of labor is carried on to a great extent, it is thought necessary that the silk should pass through the hands of many workmen before it can be brought into goods for sale. But I have been able with the assistance of one man, to turn my raw silk to a profitable account in the manufacture of fringes, cords, furniture bindings, &c, which are in demand in our market, and which have produced more profit than sewing silk. Those who do not choose to proceed any farther in the business than to raise the cocoons, may realize a reward for their industry, by selling the silk in that shape. I have lately seen regular advertisements in the papers, offering cash for cocoons; and there is no doubt but that there will soon be established throughout the United States a regular market price for the article.

But as raw silk is the shape in which the article must be sent to foreign manufacturers, if exported, and in which it meets with a cash market in almost every part

of Europe, and in many parts of our own country ; it becomes of great importance that we should reel the cocoons, at least, and that in the most economical and profitable manner. The art of reeling was formerly carried on to considerable extent in Georgia, and large quanities of raw silk were exported. It has been carried on in Connecticut for seventy years, in a way which will be mentioned hereafter. Dr Franklin addressed a letter on the subject to Dr Cadwallader Evans, from London, January 15, 1770. The Philosophical Society of Pennsylvania, to whom he sent the work of the Abbe Sauvage, a summary of which has been published by Mr Odell, of Burlington, resolved to petition the Legislature for the encouragement of this new branch of industry, and proposed to raise a fund by subscription, for the purchase of cocoons and a filature. Eight hundred and seventyfive pounds, were obtained the first year among the citizens, and this money was laid out for the purpose. But unfortunately the war of the Revolution put a stop to the scheme. Lately, however, Peter S. Du Ponceau, Esq. of Philadelphia, the friend and companion in arms of Lafayette, has made successful exertions in this department. He has associated to his labors Monsieur J. D'Homergue, who is a native of Nismes in France, and was educated in that country in an extensive manufactory of silk, and is familiar with all the processes used in that country. These gentleman have published a valuable series of essays on the subject of silk culture, the impulse of which has been felt throughout the Union, and their publication has on the whole, thrown great light on the general subject. And although the establishment of a national school of filature as contemplated by these gentle-

men, has not yet received the patronage of the government, there is strong reason to believe that it will be fully considered by Congress at their next session. Mr Du Ponceau sent me some of the silk reeled by Mr D'Homergue the last year, which was of excellent quality. I had it throwsted by Mr Brown, and returned to him. In a late letter to me Mr Du Ponceau stated that he had been honored with letters from all parts of the continent from Maine to Louisiana, requesting information on this subject. That the impulse given by the operations of Congress had been felt even in Europe; that he had caused one hundred copies of the Report of the Committee on Agriculture of the House of Representatives of the United States, to be printed in English, and one hundred in French, and to be disseminated throughout Europe. The result had been that numbers of silk manufacturers, throwsters, dyers and weavers, had come to this country from England, France and Germany, having heard at home that the silk business was encouraged here; but they have found no work for want of raw silk, and were obliged to turn to the cotton manufactories for employment. That no reelers were among them. The plan which these gentlemen have proposed might obviate this difficulty; and all must allow the convenience and necessity of having a uniform method of reeling, and of the importance of availing ourselves of all the skill and art of foreigners in this department. The elegant flag presented to Congress at their last session by Mr Du Ponceau, and a similar one to the Legislature of Pennsylvania, show what may be done in this way at some future period, if the time has not yet arrived, to creat extensive manufactories. Mr D. had about sixty pounds of raw silk reel-

ed at his filature, which he has sent to different markets to try the prices.*

Mr D'Homergue divides the raw silk into three qualities, graduated according to their different degrees of fineness. These different qualities, before they undergo the operations that are to fit them for the loom, are distinguished as first, second and third qualities beginning with the finest. They assume other names as soon as they have been prepared and made fit for the manufacturer. Then they have ceased to be raw silk, and they are called singles, organzine and tram silks, according to their different degrees of fineness, and the manner in which they have been passed through a certain machine called a mill.

* Since writing the above I have visited the city of Philadelphia, and was politely favored by Mr Du Ponceau, with liberty to make several visits to his nursery and filature. The filature was established by Mr Du Ponceau under the direction of Mr D'Homergue, in which ten reels have been employed, each of which is worked by two women under the superintendence of Mr D'Homergue. This filature is not in a room, but under a shed entirely open on one side with hangings from the roof on the other, which may be opened when required to promote a free circulation of air. The reels of this filature are made chiefly on the model of the Piedmontese reel, (vide plate) somewhat simplified by Mr D'Homergue. Mr D'Homergue put one of these reels in operation in my presence, and it appeared to work very easily. The silk reeled by Mr D'Homergue, at that time, I have preserved as a specimen, and have since been informed by an intelligent merchant of New York, that it would bring seven dollars a pound in France I was also shown several parcels of sewing silk, manufactured by Mr D'Homergue, from the refuse cocoons. I take this opportunity to acknowledge the fairness and liberality of these gentlemen in introducing me to every department of the silk business, and for the polite attentions I received from them during a visit of two or three days to their city. — Ed.

Singles (called in French *le poil*) that is to say hair silk, is made of the first quality of raw silk, consequently the finest, as the name implies. It is made of a single thread. This silk is used for the woof of the lighter stuffs, the warp which is made of cotton thread.

Organzine (in French *organsins*) is the next in fineness. It is employed in weaving to make the warp of those stuffs that are made entirely of silk.

Tram silk (in French *La trame*) which means woof silk, is thickest of the three and is the thread of which is made the woof of silk stuffs.

Of the three qualities of raw silk of which these different threads are made, the second, that which makes organzine, is the most in demand in foreign markets. It was in extracting the silk to form this quality that Mr D'Homergue discovered the superior fineness of the American silk, by finding that it required a much greater quantity of threads to produce the different qualities of raw silk above-mentioned than the cocoons of Europe.

In regard to the imperfect cocoons, Mr D'Homergue makes use of the excellent paragraph from scripture, 'gather up the fragments that nothing remain.' He says there are a great variety of these, whose threads are not susceptible of being prepared for the manufacture of silk stuffs. They are called in French *chiques*. The material extracted from these cocoons is employed in the manufacture of sewing silk. This silk is of two kinds, each of which has its first and second quality. The name of sewing silk is exclusively appropriated to the finest of these two species, the other is called cordonnet or twist.

The sewing silk, so called, is employed in the sewing of silk stuffs, the cordonnet is used for working button-

holes, and working woollen and cotton stuffs. The one is for the use of tailors, the other for milliners and mantua-makers. Tailors employ it only in the more delicate works. The raw silk for these purposes is extracted from the bad cocoons, reeled and wound into skeins, according to its different degrees of fineness, in the same manner and by the same process (varying only in details) as that intended to be used for the manufacture of fine stuffs. It is sold in market under the name of raw silk, but does not bear so high a price as the other.

There is a loose, furzy substance on the outside of the cocoons, which is neither fit for use in the silk manufactory, nor for sewing silk. This is commonly called floss. To this are added all which either form some defect in the cocoons or from the awkwardness of the reeler, either break or come out uneven, or are otherwise unfit for use, and which are called waste silk. This mass boiled in soap and water, and afterwards carded and spun on the spinning wheel, makes excellent yarn for stockings.

Mr D'Homergue classes the different kinds of silk extracted from the cocoons into six different kinds, viz.

1st, Silk of the first quality or singles.

2d, Silk of the second quality or organzine.

3d, Silk of the third quality or tram silk.

4th, Sewing Silk of the first and second quality.

5th, Cordonnet or twist Silk of the first and 2d quality.

6th, Floss Silk.

The whole of the labor of extracting these different silks from the cocoons, and all the preparatory work until it is put to the mill is done in France by women, who have separate tasks assigned to them in each of the various complicated branches of this business; the work-

shops are superintended by an overseer who is master of the whole business.

Mr Murray, a European writer, says that he visited an establishment for unwinding the silk at Buffalora on the Milanese frontier. Women were arranged opposite each other and conducted the process; the cocoons contained in baskets on one side, were thrown by handfuls into cauldrons of water, kept boiling by charcoal fires beneath. Each (by a whisk of peeled birch) collected the threads en masse; the first confused portions were rejected till the threads unwound regularly, freely passing over the glass rods to prevent the injuries of friction. The first portions, necessarily useless, are separated by the hand. When the thread came off uniformly, the cocoons were raised, suspended to the hand by their respective threads, and thus handed over to those on the opposite side, who in their turn threw them into cauldrons of water, the temperature of which was nearly that of blood heat and more than milk warm, thus sustained by a steam pipe. The water was thus kept clean and the silk preserved pure and unsoiled; from these the threads were finally wound. The proprietor informed him that this establishment cost about 60,000 francs, or about twelve thousand dollars.

This was probably Gensoul's apparatus, on which great encomiums have been passed. In this apparatus the water is heated by steam; but it is expensive and has not yet got into general use even in Europe.

We in America are not obliged to pursue the same course that is followed in Europe. The ingenuity and intelligence of our community will soon arrange a reeling apparatus by the family fireside; and that part of the year which cannot be employed in rearing the worms will be

advantageously improved in reeling the cocoons to any given pattern or degree of fineness ; nor is there in fact any more difficulty in it than in the manufacture of straw, and many other employments which have engaged the attention of our females. The time is not probably far distant, when America will excel Europe in her silk manufactures as much as she now does in her cotton.

The great requisite in reeling is evenness and equality in the threads. After the cocoons by reeling have been converted into *raw silk*, that silk, before it can be used in the manufactory of fine stuffs, must undergo the operation of *throwsting*, that is to say, *twisting*, which is done by means of a machine called a *throwing* or *throwsting mill*, and the mechanics who perform that work are called *silk throwsters*. There are several of them already in the United States, chiefly from England, but they have as yet been mostly employed in throwsting foreign silk, imported chiefly from China. The operation of throwsting is the test of the good or bad reeling of raw silk. If it be entangled, or not sufficiently freed from its gum, the threads break in the preparatory operation of winding, and that occasions much loss. If the threads are not equal, that is to say, if there is not in each thread as nearly as possible the same number of fibres, as the twisting is done by machinery which works by an equal regular motion, the force which will only twist the strong parts of the thread will break the weak ones, and that with the loss by winding, produces what is called waste. In proportion to the greater or less quantity of waste that is found in raw silk is the price or value in foreign markets.

Mr Du Ponceau has communicated to me a letter

wnich he nas received from an eminent silk merchant in Paris, in which he tells him that the best French raw silks of 15 to 20 fibres, lose only by waste 1 to 2 per cent; those of Asiatic Turkey, from 6 to 8; those of Calabria, 8 to 12; those of Valencia in Spain, 6 to 8; those of Syria, 15 to 20; and those of Saloniki and the Morea, he says, are still worse. That gentleman requires two years for the American women to learn to reel silk in perfection; but there is no doubt that they will learn in a much shorter time. The silk reeled last year at Philadelphia, by women, under the direction of Mr D'Homergue, was pronounced in England to be a fair beginning. At the last news received from that country, it had not yet been thrown, except a small sample at Manchester, which was said to have undergone every test, and produced a result highly satisfactory. In quality it was said to be superior to most Bengal silk, and equal to the silks of Friuli and Trent.

Mr Richard Radnell, a late English writer, in his view of the English silk trade, published at London in 1828, states the average waste in different silks to be as follows: — French silks, 4 to 10 per cent; Lombardy silks 4 to 12 per cent; Friuli silk, 4 to 15 per cent. So that it would seem that French silk is better reeled than Italian silk, which is different from the opinion before generally entertained. On silk from Persia, the waste is estimated from 8 to 20 per cent; and on Brutia silk, from 4 to 18.

As to Bengal silk, that which is reeled in the Company's filatures, which is distinguished by the name of Novi Silk, because it is reeled under the direction of an Italian from Novi, in Piedmont, is estimated to lose by

waste from 4 to 8 per cent, which would make it superior to French silk; while that reeled in the native filatures, as they are called, is estimated to lose from 5 to 15 per cent. See Radnell's View, p. 34.

The reeling of silk from the cocoons requires skill, practice and experience. But let not those who undertake it be easily discouraged: perseverance and attention for a short season will enable them to become expert at the business, although their first efforts may seem discouraging.

The following instructions for reeling silk, I have found from practical experience of several years, in my own family, to be useful. They are chiefly extracted from the manual published by authority of Congress.

The reeling may be done at any season, but best in dry weather; it may be carried on in the dwelling-house or in a shed, or other convenient out-building.

The softest water should be chosen for soaking the cocoons. The proper temperature cannot be ascertained until the reeling is commenced, owing to the different composition of the silk. It is as well to raise it to near the boiling point, and then, if necessary to lower it, cold water may be added. The soft or satiny cocoons require water less heated than the others. If too hot water be used they furze out in unwinding. The dupions or double cocoons require the hottest water. The fire under the basin may be lessened or increased, as the occasion may require; a little attention will soon enable the person who has the management of the basin to preserve the water at the proper degree of heat. The reeling is effected by use of a silk reel, (vide plates) and a basin of water set over a moderate fire in a small furnace. The person charged with the management of the cocoons in

the basin must be provided with a small whisk of broom corn, or birch twigs, cut sharp at the points; and being seated behind the basin, previously filled with hot soft water, and placed upon a furnace, containing burning charcoal, she must throw into the water a handful of the cocoons, and press them gently under the water for two or three minutes, in order to soften the gum of the silk, and thereby to loosen the ends of the filaments. She is then to stir the cocoons with the end of the whisk as lightly as possible, until one or more of the fibres or filaments adhere to it; when, disengaging it, and laying aside the whisk, she is to draw the filament towards her, until it come off quite clean from the floss which always surrounds the cocoon, and the fine silk begins to appear; then breaking off the thread, and collecting the floss first taken off, she must put it aside; the whisk is then to be applied again to get hold of the firm fibres, and again, until a sufficient number are procured to form the thread of silk required to be wound off. This done, she is to unite a number of the fibres, according to the fineness of the intended thread, and deliver the compound thread to the reeler, who puts it through the guides; another thread is in like manner to be prepared and passed through the other guides, when two skeins are to be wound, and they may be crossed; the threads are then raised forward and made fast to one of the arms of it. Both threads being fastened to the reel, it is to be turned with a regular, even motion, at first slowly, until the threads are found to run freely and easily; for it will happen that some of the ends which were taken to compose the thread were false, because on taking off the floss there may be two or three breaches made in the beginning of the fibres,

which, in winding, will soon end, and must be added anew to make up the number designed for the thread.

It is proper, therefore, in the beginning of the thread, to put a few more cocoons than it is intended to continue as they will soon be reduced to the proper number. The crossing of the threads is considered an improvement, though it is sometimes reeled without crossing.

As soon as the pods begin to give the threads freely, the reel is turned with a quicker motion. If the pods leap up often to the guide, the reel must be slackened, and the spinner may let the thread pass between the thumb and finger before it reaches the guide. If the thread comes off in burrs, it must be turned quicker. The fire may at any time be increased or diminished, as found necessary, that the reel may be allowed a proper motion, which ought to be as quick as possible without endangering the breaking of the thread, or hurrying the spinner, so that she cannot add fresh cocoons, as fast as the old ones are ended. The quicker the motion of the wheel is, the better the silk winds off and the better the end joins to the thread. One might imagine that the rapidity of the motion might overstrain and break the thread ; but from constant experience it has been found that the thread never breaks from the rapidity of the motion ; but on the contrary, the quicker the motion is, the more advantageous it is for winding the silk.

While the reel is turning, the spinner must continually add fresh fibres to each thread as fast as she can find the ends, not waiting till some of the number she began with are ended, because the internal fibres are much thinner than those constituting the external layers, but must constantly prepare fresh ends by dipping the whisk

among fresh cocoons, of which such a quantity must be occasionally thrown into the basin as will suffice to supply the threads which are reeling, but not more.

The cocoons thrown in must be often forced under water that they may be equally soaked, for as they swim with their greater part above water, that part would remain hard and stubborn, while the part which is under water would be too much soaked ; some hot water may be thrown upon them frequently with a brush, and also on the cocoons which are reeling, when they grow dry at the top and yield the fibres with difficulty. The supplying fresh ends when the cocoons are exhausted, or diminished or the fibres break, is performed by taking one end of a fibre and throwing it lightly on the one that is winding, and rolling them between the thumb and finger, or gently pressing them.

As often, therefore, as the cocoons, partially wound, are exhausted, or the fibres break, fresh ones must be joined to keep up the number requisite, or the proportion ; thus three new ones may be wound and two half wound, or four new ones, and the silk will then be a thread of four to five cocoons. The adroitness in adding fresh ends can only be acquired by practice. The difficulty of keeping the thread even is so great, owing to the increased fineness of the fibre inside, that we do not say a silk of three or of four or of six cocoons, but a silk of three to four, of four to five, and of six to seven.

In coarser silk we do not calculate so nicely as one cocoon more or less ; we say for example from twelve to fifteen, from fifteen to twenty cocoons. In beginning a thread of ten cocoons, from sixteen to twenty will sometimes be required to preserve a uniform thread, after a

portion of the first layer has been wound off. The quantity of silk which can be reeled in any given time, is in proportion to the quickness with which the spinner can add fresh cocoons. Thus, if we suppose that every cocoon at a medium, will either break or be wound off at the end of every five hundred feet, then, if five such pods are reeled together, one will be wanted to every hundred feet that are reeled; if ten are reeled together, one will be wanted at every fifty feet; if sixteen together, then at thirtyone feet, and so on. The seldomer cocoons end, or break, the greater number of them can one spinner attend, which shows the advantage of sound cocoons and of expert management in reeling.

The cocoons which wind off in part only and the shells must not be permitted to remain in the water, as they will obscure and thicken the water, and injure the color and lustre of the silk, which can then be used only for dark colors. The shells should be buried to prevent their being offensive; as a general rule, the water should be changed as soon as it becomes discolored.

When the spent cocoons leap up and adhere to the guide wires, they must be immediately taken away, else by choking the passage they will endanger the breaking of the thread.

When the reel has remained any time idle, the thread between the basin and the wires may be wet, to cause the thread to run easily.

In winding off the best cocoons some defective ones will be found amongst them, which will not wind off or are full of knobs; these should be taken out of the basin immediately in order to be wound by themselves.

The breaking of the fibres is principally owing either

to bad cocoons, viz. being ill formed, (as they will be when the worms were disturbed and interrupted during their spinning,) or the fibres may break by improper regulation of the heat in the water; first, when it is not sufficient to make the silk come off easy, or second, when it is too great and occasions burrs, which may stop at the holes through which the thread runs; cocoons also which have two worms inclosed will perpetually break; the whole thread may also break, by burrs stopping at the holes of the guides, or by the reel being turned by jerks. It may be fastened like the fibres, by laying the parts on one another, and giving them a little twist.

A sharp fork may be conveniently made use of to draw away the spent cocoons, or such as being nearly spent, stick at her holes in the guides; and as the whisk will frequently take up more ends than are immediately to be added, and as the spinner will sometimes have occasion to employ both her hands, the brush may at that time be conveniently hung up by the basin, while the cocoons which are attached to it remain in the water, and the ends will be in readiness as they are wanted. If the spinner be under the necessity of leaving off work for any length of time, the cocoons should all be raised with a skimming dish out of the water till her return, otherwise by oversoaking they would wind off in burrs; but it is best to continue the reeling without interruption, and to let fresh, but equally experienced persons, succeed those who are tired. The person who turns the wheel should have an eye to the thread and to the guide wires through which they pass, that he may apprise the spinner when anything is wrong; for her eyes will be sufficiently employed about the cocoons. The reeler may also rectify anything dis-

covered to be amiss in those parts of the thread which are near the reel, for one hand will always be employed, and a stop must occasionlly take place.

As the heat of the water in the basin will require to be varied according to the ease or difficulty with which the different sorts of cocoons give off their silk, the spinner should always have some cold water within reach, in order to cool that in the basin quickly, when the silk comes off too easily and in burrs. The water is also necessary for the woman managing the cocoons, to cool her fingers.

More fuel should also be at hand to increase the heat quickly, when the cocoons do not give off their silk readily.

If there should happen to be any sand in the water, the heat causes it to rise to the surface and fix on the cocoons, the thread of which will break as if cut; for this reason the utmost care must be taken to guard against it, and to remove it. Previously to being boiled, the water should be permitted to settle, and the pan must be carefully wiped. If necessary, the basin may be covered while the water is heating.

When the cocoons are first put in water, if the silk rises thick upon the brush or comes in lumps, it is a sign that the water is too hot; if the thread cannot be caught, the water is too cold ; when the cocoons are in play if they rise often to the guide wires, the water is two hot; if the cocoons do not follow the threads, it is too cold. It will be seen, by observing the position of the thread upon the reel, that the different layers do not lie parallel to, nor upon, but cross one another. This is owing to the mechanism of the apparatus, and is particularly contrived to effect this object, which is essential to the perfection of the process, and one to which the acknowl-

edged superiority of the Italian silk is to be ascribed. It is effected by the see-saw motion of the distributing rod, which depends upon the relative proportion between the axle and pulley; without this crossing, the threads, from their gummy nature, would inevitably adhere and render the subsequent windings and twistings of the silk very difficult; this sticking together of the silk is called glazing. But the mechanism abovementioned of the distributing rod, prevents the threads lying over each other upon the reel until after it has made many revolutions, and the former threads have dried. During this time the exposure of the threads to the air, causes the first layer to completely dry and hence no adhesion between them can take place.

The effect of the irregularity of the movement caused by the distributing rod is also to imitate in the unraveling of the cocoon, the same method employed by the silk caterpillar in forming it; for it is a fact, that the silk fibres of the cocoon are spun on it in zigzags, like those formed by the silk reel, and consequently the operation of the reel is an imitation of nature, of which the industry of the caterpillar instructed by her is the prototype. Mr Nouaille says, that a woman at Novi, (Italy,) experienced in the business with the assistance of a girl to turn the reel and attend to the fire under the cauldron, can with ease reel off one pound of silk consisting of four or five cocoons of the most perfect quality in a day. I am credibly informed that the price of silk reeled according to the above directions, in Europe, is from four to seven dollars, according to its fineness. Mr D'Homergue says a woman may now reel three pounds in a day. Mr Brown thought he could reel a pound in a

day upon my improved reel, but I have never been able to have the finer qualities of silk reeled so rapidly in my family. The silk reeled upon my reel* sells for $4,50 per pound as it comes from the reel, and some at a higher price. My reel is similar to the Piedmontese, with some considerable improvements; it is finished in a much neater style than any I have seen in this country; it is portable and will be furnished to any who may apply, for the sum of twentyfive dollars.

In preparing the dupions or double cocoons for winding, more are put into the basin at once than of the finest kind. They must be first well cleaned from the floss outside; the water also must be boiling hot, and as the silk they yield is of a coarser quality than the other, and has a good deal of floss upon it, the person who turns the reel must take the opportunity, while the one who manages the basin is preparing the cocoons for winding, to clean and pick off the loose silk from that which is on the reel. These make a coarser thread of fifteen to twenty cocoons; and perhaps as coarse as from forty to fifty cocoons; it is useful for filling in coarser stuffs and likewise for sewing silk.

The satiny cocoons require water only moderately heated. The proper heat will be found by observing the manner in which the silk comes off from the first of them which are put in a basin, and as already said of cocoons generally, if it come off thick, cold water must be added until the proper temperature be attained. The gum is taken out of the silk by boiling it in soap suds.

*The fringe of the curtains in the house of Hon. Daniel Webster of Boston, was made by Mr Brown from silk raised by me and reeled in my filature. — Ed.

METHOD OF REELING COCOONS AND MANUFACTURING SILK IN CONNECTICUT.

In the first place the cocoons are stripped of their floss and sorted according to their quality. Then a large kettle set in a furnace or in an arch is filled with water, and fire is kept under it; and when it is about to boil a quart of cocoons is thrown into it. They are immediately stirred perpendicularly in the water by a bunch of broom-corn tied close together as large as a person's arm, and cut square at the end, or by a corn broom, or something similar. In this way the ends are collected and attached to the bushy extremity. They are then drawn up by shaking the broom or whatever they are collected with, up and down in order to keep the cocoons in the water, otherwise they would rise. If enough for a thread is not collected the first time, those ends that are drawn up are taken off the bush with the hand and drawn to one side of the kettle. The process is then repeated until a sufficient number is collected to form a thread of the size required, which is usually from eighty to one hundred and fifty cocoons.

Reeling is then commenced on a common hand reel, (such as is in common use in families in New England for reeling yarn from the spinning wheel), and the silk fibres run off about as fast and with as little difficulty as yarn from a spindle. Some of the cocoons run off before others; and when on this account the thread becomes too small, all the fibres are broken off, and what is reeled is tied by itself on the reel and another quart of cocoons is thrown into the kettle; the ends are collected and reeled in the same way as before, and each

separate piece is tied by itself. When the reel is full the pieces are all tied together, taken off and immediately dried.

Most of this silk is manufactured into sewing silk and twist in the following manner: — it is immersed for a few moments in boiling water, taken out, put on swifts and spun or twisted on a common woollen wheel, beginning at the large end of the piece, that is at the end which was reeled first: and when it becomes too small, which is the case when one half or two thirds is run off, the small end of another piece is added to it, and thus they are twisted together. It is then spooled directly off the spindle; a sufficient number of spools is put into a small spool frame to make a thread of a proper size, which is twisted again while it is moist. It is then reeled again and cleansed by boiling in strong suds for three hours, then dried and colored. Undergoing this process it shrinks about one half in weight; after this, for sewing silk, it is doubled, twisted and reeled on a reel two yards long, and is divided into skeins of twenty threads each, as the statute of that State requires. If it be calculated for twist, it is made three threaded, twisted and done up into sticks with a small hand machine, and is then ready for the market. The floss, or tow, as it is called, is boiled in strong suds for three hours, dried, picked, carded, and spun on a common wool wheel. The yarn is woven into cloth, which is worn by the women for every-day gowns. It is sometimes manufactured into very strong and durable carpets.

Those cocoons that the grubs have pierced are boiled as above and dried. The end that is not pierced is cut off; they then are spun on a linen wheel like worsted,

beginning at the end cut. It is then twisted together, three threaded and knit into stockings.

The imperfect cocoons, and all that will not reel, are boiled, carded, spun and manufactured in all respects like floss, but they make nicer and finer cloth.

The Connecticut sewing silk doesnot bring a higher price than the reeled silk as it comes from my reel. As there is a loss of one half of the weight in the preparation of sewing silk, it is evident that to reel it properly and sell it for raw silk would bring a hundred per cent more profit.

GIDEON B. SMITH'S IMPROVED SILK REEL.

(SEE PLATE.)

This is an improvement on the Silk Reel of Piedmont. The improvement consists in the simplicity of the machinery, compared with that of the Piedmontese Reel, the operation of both being exactly the same. A, is a cylinder eight inches diameter and eight in length. B, a circular groove, half an inch deep, which has a sweep of six inches. To lay out this groove, a strip of paper six inches wide and of the exact length of the cylinder's circumference, is doubled, and with the compass a sweep is made from the middle of one end of the doubled paper to the edge and thence to the middle of the other end; the paper is then turned over and the same sweep made on the other side, in an opposite direction. The paper is then laid on the cylinder, and the groove marked upon it for cutting. Thus on each side of the cylinder the groove will form a semi-circle meeting in the middle, and will thus cause a peculiar motion to the traversing bar, (C,

which it will cause to move slowly at the extremities of its course and rapidly in the centre, thus giving time for the threads to take hold of the rails of the reel on the outside of the skein before it begins to move back. C, the traversing bar, with the brass hooks through which the silk passes. D, a bar of the frame on which a brass plate is fixed, with small holes, for the silk to pass through, and which stands immediately over the vessel containing the cocoons. E, the drum, eighteen inches diameter. F, the pulley, ten inches diameter. The size of the drum and pulley precludes the possibility of the band slipping.

The whole frame is five feet long, four high, and two wide in the clear, and the timber about two inches square. It is put together with keys, for the convenience of taking down and putting up.

The necessity of the machinery for producing the vibratory motion of the traversing bar, will be understood when it is stated, that, if the threads are laid on the rails as cotton is reeled they would adhere and become useless, as they could not be separated. The traversing bar causes them to be laid on in such a manner as to obviate this entirely. By a small handle near the rim of the drum, the reel is turned. With this reel the relative proportionate diameter of the drum and pully is necessary, to produce the proportionate movement of the traversing bar, and the revolution of the reel, as the bar must move back and forth five times, while the reel makes nine revolutions, and as the groove is formed, one revolution of the cylinder causes the bar to move out and back once. This reel I have not seen, but give the description of it as published.

APPENDIX.

Short Historical Account of the Efforts of Silk Culture in this Country.

In America the culture of the silk worm was introduced into Virginia in 1623 by James I. who himself composed a book of instructions on the subject, and caused mulberry trees and silk worms' eggs to be sent to the colony. He made great efforts to have it take place of the tobacco in agricultural pursuits. Thirty years afterwards it was enacted that every planter who should not have raised at least ten mulberry trees for every hundred acres of land in his possession, should be fined ten pounds of tobacco. Five thousand pounds of tobacco were promised to any one who should produce one thousand pounds of wound silk in one year. In 1664, Mr Walker, a member of the legislature, stated that he had seventy thousand mulberry trees on his estate. In 1666, all statutory provisions were repealed, because the business was in so thriving a condition as no longer to require protection. The decline of silk business in that state was probably owing to want of perseverance. The new emigrants brought with them new views and habits; and as they brought their slaves, it became necessary that an immediate annual profit should be realized. Hence the culture of rice and indigo was introduced, and on account of the immediate profit derived from their culture, that of silk languished, which would have required a steady perseverance for a course of years

The culture of silk was introduced into Georgia at the earliest period of its settlement. The trustees ofthe colony transmitted mulberry trees as well as seeds and silk worms' eggs. The public seal of the colony represented silk worms in their various stages. In the year 1736 a quantity of raw silk was raised in that colony, and was manufactured at Derby, by Sir Thomas Combe, into a piece of stuff and presented to the queen. A few years before our Revolution considerable quantities of raw silk began to be exported to England, which was found equal to the best silk of Piedmont, and to be worked with less waste than the China silk. In 1776 more than twenty thousand pounds of raw silk were imported into England from Georgia.

No result of any consequence seems to have followed the exertions of Dr Franklin to establish a filature at Philadelphia in 1769. The revolution came on and put an end to the undertaking. There is little doubt that if the United States had continued to remain British colonies, the culture of silk would have made an immense progress in this country, because its promotion was a matter of vital interest to the mother country, whose manufacturers would have been furnished from hence with the raw material, which they are obliged to purchase at a great expense, drawing very little from their dominions in Bengal, where it seems it is imperfectly prepared.

In Connecticut this culture has been attended to for seventy years, and it is probable that about four tons are now raised annually in the county of Windham. I was told by an intelligent citizen of that county during my visit there in 1828, that the culture was found profitable and was the best business they could pursue. I found many families, in some towns nearly all, engaged in raising silk. A family makes ten, twenty, fifty, or a hundred pounds in a season, according to their supply of leaves. It is evident that they will derive much advantage from introducing European skill into their manufacture of the article. I am told that during the present season they have erected a factory and employ several European artists. There is every reason to believe that a rapid increase of production

will soon take place in many of the states of the Union. In New Hampshire, Vermont, and Maine, silk has been cultivated in small quantities with success. Individuals in Massachusetts have cultivated it with success for thirty years, and there is not, probably a farm in the state on which it may not be raised. The beautiful specimens of the article produced at the agricultural exhibitions in different parts of the Union show the degree of interest excited at the present time on the subject, and indicate that at no distant day great national wealth will be derived from the exertions that are now undertaken in this department.

EXPLANATION OF THE SILK REEL OF PIEDMONT.*

The frame is 6 feet 5 inches long, $4\frac{1}{2}$ by 3 inches thick. Distance of the upright posts AB, 4 feet $4\frac{1}{2}$ inches.

CC. Length of the braces of the frame, 20 inches in the clear.

DD. Legs of the frame, 2 feet $3\frac{1}{2}$ inches long. E, shaft with a crown wheel at each end. The wheel F, $9\frac{1}{10}$ inches in circumference, has 22 teeth. The wheel G, 10 inches and $2\frac{1}{10}$ in circumference, has 25 teeth. This shaft has an iron pin at each end 1 inch long. The pin at the end G, plays in a hole in the shoulder near the top of the post O, so as to enable the teeth of the wheel to catch and work in those of the pinion at the end of the axle of the reel, which axle, by means of a pin at the end, also plays in a hole in the post O. The pin at the other end of the shaft plays in a hole in the post K, and the teeth of the wheel F, work in the pinion H, fixed on the top of the post K, by means of a burr screwed on the pin projecting from the post and passing through the centre of the pinion. This pinion has 35 feet. On the top of the pinion H, is a crank, having a sweep of 4 inches, and receives on its top the end of the iron wire-carrier of the traversing bar I. The crank is fixed half an inch from the commencement of the grooves of the pinion. This crank is shown in the figure H. I, a traversing bar, 2 feet

* See Plate.

10 inches long, $\frac{5}{8}$ of an inch wide, $\frac{3}{4}$ of an inch thick. playing through the posts BK : height of the post from the frame 17 inches.

L, an iron carrier of wire, No. 1, 18 inches long, fixed to the bar I, to work free by a screw. The other end is fixed by a burr to the pin passing through the centre of the pinion H.

MM. Two wire hooks or eyes, (rampins) $7\frac{3}{4}$ inches apart, at equal distances from the ends of the traversing bar through which they pass. The wires to the commencement of the turns of the hooks are 5 inches in length.

N. The reel ; arms, 2 feet $2\frac{1}{10}$ inches long in the clear ; $1\frac{1}{2}$ inches wide, and $\frac{8}{10}$ of an inch thick ; rails, $20\frac{3}{4}$ inches long, 2 inches broad, $\frac{8}{10}$ of an inch thick ; two of the arms are jointed, to allow the skeins of silk to be taken off when reeled and quite dry. There ought to be an extra reel to put in the place of the one taken off to prevent the work stopping.

O. Upright support for the axle of the reel, on the ends of which the pinion is fixed, to work with the wheel G, at the end of the shaft E. The pinion of the axle has 22 teeth.

P, an iron plate with four holes, 12 inches long, slightly hollowed, projecting $3\frac{1}{2}$ inches from the bar : the outside holes are 3 inches from the ends ; from the centre of one hole to that of the next, $\frac{3}{4}$ of an inch. Distance from the two inside and nearest holes, $4\frac{2}{10}$ inches.

Q. The copper basin to contain hot water, in which the cocoons are immersed when reeling off. It is 18 inches long, 1 foot broad, and $4\frac{1}{2}$ inches deep.

R. The furnace to contain charcoal, to keep the water hot.

Distance from the centre of the posts AB and OK, $36\frac{1}{2}$ inches. Circumference of the reel 6 feet 11 inches.

Distance from the top of one arm, where it enters the rail, to another arm, $18\frac{1}{2}$ inches.

From the axle of the reel and the traversing bar I, 4 feet 8 inches.

YB 16259

NEW WORK ON FRUITS, &c.

IN PRESS BY

CARTER & HENDEE, AND J. B. RUSSELL,

BOSTON,

The NEW AMERICAN ORCHARDIST, or an Account of the most valuable Fruits and Vegetables adapted to cultivation in the climate of the United States, with their Modes of Culture and Management; Remedies for the Maladies to which they are subject from Canker Worms, Borers, &c. By WM. KENRICK.

This work will contain particular descriptions of from 700 to 800 select varieties of fruit, adapted to our varied climate, and will include the Olive and some most useful tropical fruits which may be successfully cultivated in our Southern territories.

The different modes by which the new varieties of fruit have been obtained, will be described; modes of pruning and training, by which trees, &c, are rendered fruitful: of grafting and inoculation; and of the modes of propagating usually adopted.

It will contain descriptions (besides old sorts) of from 100 to 120 *new varieties* of Pears of UNDOUBTED EXCELLENCE; from 60 to 80 of which are not particularly described and condensed in any one European volume which has hitherto reached us; some American, but chiefly the new and most approved Flemish varieties.

The descriptions are partly from personal observation, and from assistance received from some of the most intelligent horticulturists of New England; from the best writers of America, and the best foreign productions; the descriptions of Van Mons, the splendid edition of New Duhamel, the Pomological Magazine, the superb Pyrus Malus Brentfordiensis of Ronald, and Lindley's Guide to the Orchard and Kitchen Garden. From these it has been the constant aim, to cull from their *extremely varied* and *select lists*, all that was *beautiful, excellent, productive* and *profitable.*

From these will be formed *another select list*, of those sorts already approved *with us*, as the *best and most productive.*

In regard to the *new varieties* of fruits of America and of Europe, it will be the aim of the writer, to render this work particularly interesting, and adapted to the different sections of our highly favored country.

The very best of late English works, we refer to those just named, those celebrated works which are beyond all doubt *so admirably adapted to the climate and country for which they were principally designed*, and as auxiliaries to us, are extremely deficient in regard to those native fruits which are with us so highly esteemed.

It will be comprised in one volume of about 300 pages, and will be furnished for about $1 per copy.